

Atty. Docket No. PIA31075/DBE/US
Serial No: 10/750,246

Amendments to the Claims

Please amend claim 8 and add new claims 20-24 as follows:

1. (Previously Presented) A method of removing polymer generated in a semiconductor manufacturing process, which includes sequentially depositing a lower metal layer, an insulating layer and an upper metal layer on a semiconductor substrate; forming a photoresist pattern on the upper metal layer; and etching the upper metal layer and the insulating layer by using the photoresist pattern as a mask, the polymer being generated during the etching step, the method comprising:

- (a) removing the photoresist pattern by using O_2/N_2 plasma;
- (b) removing the polymer existing on the lower metal layer by using H_2O/CF_4 plasma; and
- (c) using a plasma from a gas consisting essentially of O_2 , removing residues of the photoresist pattern remaining after (b).

2. (Original) A method as defined by claim 1, wherein (a) is carried out for about 50 seconds.

3. (Original) A method as defined by claim 1, wherein a flow rate of a CF_4 gas in (b) is in a range from 5% to 15% of that of an H_2O gas.

4. (Canceled)

5. (Previously Presented) A method as defined by claim 1, wherein powers used in the (a), (b) and (c) are substantially the same.

6. (Previously Presented) A method as defined by claim 1, wherein a process time of (c) is in a range from 40% to 60% of that of (a).

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7. (Previously Presented) A method as defined by claim 1, wherein a process time of (b) is in a range of 30% to 50% of that of (a).

8. (Currently Amended) A method of manufacturing a semiconductor device having a capacitor, the method comprising:

- (a) sequentially depositing a lower metal layer, an insulating layer and an upper metal layer on a semiconductor substrate;
- (b) forming a first photoresist pattern on the upper metal layer;
- (c) forming an upper electrode film and a capacitor insulating film by etching the upper metal layer and the insulating layer by using the first photoresist pattern as a mask;
- (d) removing the first photoresist pattern by using O_2/N_2 plasma;
- (e) removing polymer existing on the lower metal layer by using H_2O/CF_4 plasma, then removing remaining residues of the first photoresist pattern using a plasma from a gas consisting essentially of O_2 ;
- (f) forming a second photoresist pattern for completely encapsulating the upper electrode film and the capacitor insulating film;
- (g) forming a lower electrode film by etching the lower metal layer by using the second photoresist pattern as a mask; and
- (h) removing the second photoresist pattern to provide the capacitor including the lower electrode film, the capacitor insulating film and the upper electrode film.

9. (Canceled)

10. (Previously Presented) A method of removing polymer from a lower metal layer having an insulating layer and an upper metal layer thereon, the lower metal layer on a semiconductor substrate, the upper metal layer having a first photoresist pattern thereon, the method comprising steps of:

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(a) removing the first photoresist pattern by ashing with a first plasma from a first gas mixture consisting essentially of O_2 and N_2 ;

(b) removing the polymer on the lower metal layer by ashing with a second plasma from a second gas mixture consisting essentially of H_2O and CF_4 ; and

(c) removing remaining residues of the first photoresist pattern with a third plasma from a gas consisting essentially of O_2 .

11. (Previously Presented) A method as defined by claim 10, wherein step (a) is carried out for about 50 seconds.

12. (Previously Presented) A method as defined by claim 10, wherein step (b) comprises flowing CF_4 gas at a rate of from 5% to 15% of that of H_2O gas.

13. (Canceled)

14. (Previously Presented) A method as defined by claim 10, wherein steps (a), (b) and (c) each use substantially the same power.

15. (Previously Presented) A method as defined by claim 10, wherein a process time of step (c) is from 40% to 60% of that of step (a).

16. (Previously Presented) A method as defined by claim 10, wherein a process time of step (b) is from 30% to 50% of that of step (a).

17. (Previously Presented) The method of claim 10, further comprising, prior to step (a), steps of sequentially depositing the lower metal layer, the insulating layer and the upper metal layer on the semiconductor substrate; forming the first photoresist pattern on the upper

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metal layer; and forming an upper electrode by etching the upper metal layer using the first photoresist pattern as a mask.

18. (Previously Presented) The method of claim 17, further comprising, after forming the upper electrode and prior to step (a), forming a capacitor insulating film by etching the insulating layer using the first photoresist pattern as a mask.

19. (Previously Presented) The method of claim 18, further comprising, after step (b), steps of forming a second photoresist pattern completely encapsulating the upper electrode and the capacitor insulating film; forming a lower electrode by etching the lower metal layer using the second photoresist pattern as a mask; and removing the second photoresist pattern to provide a capacitor including the lower electrode film, the capacitor insulating film and the upper electrode film.

20. (New) A method as defined by claim 1, wherein the O_2/N_2 plasma is formed from a gas mixture consisting essentially of O_2 and N_2 .

21. (New) A method as defined by claim 20, wherein removing the photoresist pattern is performed before removing the polymer existing on the lower metal layer.

22. (New) A method as defined by claim 8, wherein the O_2/N_2 plasma is formed from a gas mixture consisting essentially of O_2 and N_2 .

23. (New) A method as defined by claim 22, wherein removing the photoresist pattern is performed before removing the polymer existing on the lower metal layer.

24. (New) A method as defined by claim 10, wherein removing the first photoresist pattern is performed before removing the polymer on the lower metal layer.